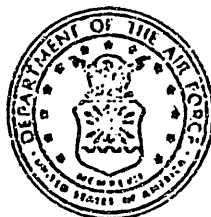


(1)

DEPARTMENT OF THE  
AIR FORCE

SUPPORTING DATA FOR FISCAL YEAR 1984  
BUDGET ESTIMATES

SUBMITTED TO CONGRESS JANUARY 31, 1983



DESCRIPTIVE SUMMARIES

RESEARCH, DEVELOPMENT, TEST AND EVALUATION

This document has been approved  
for public release and sale its  
distribution is unlimited.

83 03 22 081

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63425F

Title: Advanced Warning System

DoD Mission Area: Strategic Surveillance and Warning, #332

Budget Activity: Strategic Programs, #1

1. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
TOTAL FOR PROGRAM ELEMENT		7,962	10,000	30,863	76,178	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The objective of this program is development of infrared technology (i.e., mosaic sensor arrays, large capacity data processors, lightweight optics, tunable spectral filters, and passive/active thermal coolers), relevant to the strategic missile warning and attack assessment mission, to achieve confidence for a decision to proceed with development of a survivable tactical warning/attack assessment system capable of performing the missile warning functions throughout all phases of nuclear war. The capability to support additional missions such as technical intelligence, tactical theater operations, and air vehicle detection and tracking will be investigated with this program.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY (\$ in thousands):

RDT&E	9,962 <sup>1</sup>	20,800 <sup>2</sup>	48,738	Continuing	Not Applicable
-------	--------------------	---------------------	--------	------------	----------------

<sup>1</sup> (U) The \$2M decrease in RDT&E funds for FY 82 was due to a reallocation to other high priority Air Force programs.

<sup>2</sup> (U) The full amount of the FY 83 request was not appropriated by Congress.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. RELATED ACTIVITIES: [ ] is the existing space-based missile early warning system. Infrared background and target measurements are conducted in PE 63424F, Missile Surveillance Technology.

6. (U) WORK PERFORMED BY: Rockwell International, Thousand Oaks, CA; Grumman Aerospace, Irvine, CA; Irvine Sensors, Costa Mesa, CA; Honeywell, Minneapolis, MN. Air Force Systems Command is responsible for overall management of this program element. DARPA provides technical guidance through the joint program plan. Space Division, Los Angeles, CA, Rome Air Development Center, Griffiss AFB, NY, and Aeronautical Systems Division, Wright-Patterson Air Force Base, OH, are responsible for management of technology development projects associated with the joint development program.

7. (U) PROJECTS LESS THAN \$10 MILLION IN FY 84: Not Applicable.

Program Element: 163425P  
DoD Mission Area: Strategic Surveillance and Warning, #332

Title: Advanced Warning System  
Budget Activity: Strategic Programs, #3

8. (U) PROJECT OVER \$10 MILLION IN FY 84:

(U) PROJECT: 2847, Advanced Warning System (AWS)

A. (U) PROJECT DESCRIPTION: AWS is being designed to provide a survivable and enduring missile warning system throughout a nuclear conflict. The use of new technologies such as mosaic focal plane and on board data processing will make AWS capable of providing missile warning and attack assessment data direct to users, eliminating the need for vulnerable ground processing stations. The capability to satisfy additional missions such as tactical theater, technical intelligence, and air vehicle detection and tracking will also be evaluated. Several technology development contracts will be initiated to achieve those objectives.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 82 Accomplishments: Work on developing focal plane technology has proceeded very smoothly and comprises the bulk of the FY 82 effort. Integrated circuit chips for two of the alternate concepts have been produced. These chips are now being stacked into modules to be combined into actual focal planes. Additionally, an engineering model of a tunable filter has been developed, and work is progressing in on-board processing.

(2) (U) Basis for FY 1983 RDT&E Request: The FY 1983 RDT&E program will continue the infrared technology program which was initiated in FY 1981. This includes development of broad band infrared mosaic sensors, compact data processors with large data capacity, and further evaluation of metal and glass lightweight optical components. Emphasis will be given to manufacturing methods for mosaic array and data storage chip fabrication.

(3) (U) FY 1984 Planned Program and Basis for FY 1985 RDT&E Request: The AWS program is intended to provide a survivable sensor system to augment or possibly replace the current missile surveillance system. A major objective of the AWS program is to efficiently develop the key subsystem technologies for several candidate concepts. The FY 84 effort will continue work begun by DARPA in FY 81 and picked up by the Air Force in FY 82. The program is concentrating on five critical technologies: infrared focal planes, on-board processors, tunable filters, lightweight optics, and cooling techniques. The majority of this effort is going into the starting mosaic focal plane. To minimize the risk, four contractors will pursue this effort in FY 83 and FY 84. At the end of FY 84, during a major program review, the focal plane configurations will be narrowed to two. During FY 84, this program will continue to be in advanced development, but the major program review will assess the status of all the technology efforts to determine if they can support a full Scale Development decision in FY 85. To further support this full-scale development decision, conceptual system design work will begin in FY 84. Therefore, the funds in FY 84 will pay for critical technologies and system concept design, leading to a full scale development, milestone decision in FY 85. The cost estimates were derived from a Program Office and Aerospace Corporation (Federal Contract Research Center) cost evaluation using contractor estimates and historical data from similar efforts.

(4) (U) Program Completion: This continuing program is projected to begin full scale development in FY 85.

C. (U) MAJOR MILESTONES: None Available

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #12431F

DOU Mission Area: Strategic Surveillance

Title: Defense Support Program

Budget Activity: Strategic Programs, 33

1. (U) RESOURCES (PROJECT LISTING) (\$ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
TOTAL FOR PROGRAM ELEMENT		145,750	120,287	48,669	53,966	Continuing	Not Applicable

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Defense Support Program (DSP) is the key element of the [ ] It is a space-based surveillance system that [ ]

[ ] The system consists of three satellites in geostationary orbit, two large processing stations, one simplified processing station, one multi-purpose facility, and a ground communications network. The DSP provides [ ]

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY (\$ in thousands):

RDT&E	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Procurement (Missile)	241,354	407,500	366,300		Continuing	Not Applicable
Procurement (Other)	101,140	89,292	5,343		Continuing	Not Applicable

1/ FY 1984 RDT&E and Procurement (Missile) changes due to revised inflation indices.

2/ FY 1984 Procurement (Other) change due to increase in scope caused by peripheral replacement and ground station compatibility with new satellites.

4. (U) OTHER APPROPRIATION FUNDS (\$ in thousands):

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Procurement (Missile/ (Qty, Satellites)	241,400	404,960	356,930	35,836	Continuing	Not Applicable
Procurement (Other) (Includes Initial spares)	100,106	87,792	28,413	50,740	Continuing	Not Applicable
(Qty, Mobile Ground Terminals)	(2 MGTs)	(2 MGTs)				
Military Construction Program		1,900			Continuing	Not Applicable
Operations And Maintenance (Software)	52,802	31,839	10,271	43,666	Continuing	Not Applicable

Program Element: #124317

COD Mission Area: Strategic Surveillance

Title: Defense Support Program

Budget Activity: Strategic Programs, B

5. RELATED ACTIVITIES: Program [ ] were predecessor programs. Program [ ] were prior program designators. [ ]

are developing the technology for [ ]

Appropriate procurement phasing with the follow-on Defense Support Program (DSP) is being addressed in program planning. Defense Satellite Communications System (P.E. 33110F) provides primary communications routing for DSP overseas data and will help provide Mobile Ground Terminal communications. Space Boosters (P.E. 35119F) provides launch support. Space Vehicle Subsystems Advanced Development (P.E. 63401F) is developing technology for improved satellite navigation, power, and propulsion systems. [ ]

tery Command and Control Systems (WWMCCS) [ ]

DSP is the key element of the Worldwide Military [ ] and is related to the other [ ] of the network

(WWMCCS Architecture P.E. 63733F). The WWMCCS Architecture also provides systems engineering and integration technical support to the [ ]

After transition to the Space Shuttle, Space Launch Support Program (P.E. 35171F) will provide Inertial Upper Stages and Space Shuttle flights for DSP missions. DSP Communications (P.E. 12447F) provides operations and maintenance for the DSP Ground Communication Network.

6. WORK PERFORMED BY: Commander-in-Chief, Aerospace Defense Command, maintains operational control of DSP for the Joint Chiefs of Staff. Strategic Air Command and the Air Force Communications Command are the system operators and maintainers of the DSP ground stations. Ground Station Operations will transition to Space Command during FY 1984. Air Force Systems Command's Space Division, Los Angeles, CA, has overall development and procurement management responsibility and program management of the satellites. The Air Force Logistics Command provides engineering and logistics support. Air Force Weapons Laboratory, Kirtland Air Force Base, NM, will provide facility support. The Air Force Test and Evaluation Center, Kirtland Air Force Base, NM, participates in test and evaluation of selected system segments. TRW, Redondo Beach, CA, is the prime contractor for the spacecraft and satellite integration. Aerojet Electro Systems Company, Azusa, CA, is the prime contractor for the infrared sensor and the computer replacement. The Department of Energy (Sandia Corporation) has responsibility for the [ ] IBM, Thousand Oaks, CA, is the prime contractor for all software efforts as well as the prime contractor on the Mobile Ground Terminals. The Aerospace Corporation, Inglewood, CA, furnishes general systems engineering/integration for the DSP System Program Office.

7. (U) PROJECTS LESS THAN \$10 MILLION IN FY 1984: Not Applicable.

8. (U) PROJECTS OVER \$10 MILLION IN FY 1984:

(U) PROJECT: Defense Support Program

A. PROJECT DESCRIPTION: The development of satellite transition to the Space Shuttle/Inertial Upper Stage and the Titan 343 (34N)/ Inertial Upper Stage will continue. All satellites from 16 and beyond will be launched with the Space Shuttle. The design of the hardware and software for the ground stations to be compatible with satellites 14-17 upgrades will begin. These upgrades include the satellite-to-satellite crosslink, the second color focal plane, the also

Program Element: 612411P

DDO Mission Area: Strategic Surveillance

Title: Defense Support Program

Budget Activity: Strategic Programs, #1

elin data message rebroadcast capability] Satellites 16 and 17 will be procured on a fully funded basis using advance procurement material procured in FY 1982. Orbital operations support, satellite maintenance and other efforts associated with maintaining a three satellite operational force structure will continue. The replacement of the peripherals will be continued, as well as modifications to the operational software to support improved satellite capabilities.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) FY 82 Accomplishments: Defense Support Program (DSP) Flight 10 was launched on 11o replace Flight 8 which had lost its primary attitude determination system. The Flight 10 launch and checkout was successful and it was deployed. This was the first launch of the

] The satellite 14-17 spacecraft design was continued through FY 1982 and the sensor design was completed with a Critical Design Review. The satellite 14-17 sensor includes the Sensor Evolutionary Development capability, the second color addition, and a survivable star sensor which is the last major component on the satellite to be nuclear hardened. Advance procurement material for satellites 14-17 was put on contract in FY 1982. The Mobile Ground Terminal design was completed and the option for production units 2 and 3 was exercised. The critical design review included five major subsystems: data processing equipment, software, communications, antenna and transportation. The ground station computer replacement continued throughout FY 1982 with the replacement, checkout and operational software certification at the Multi-Purpose Facility at Lowry AFB, CO. The first of three operational computer strings was replaced at the Continental Ground Station (CGS). Planning and site preparation for the move of the Simplified Processing Station] was completed. The Navy has expressed interest using the DSP

] A Navy observer spent a couple of months at the Overseas Ground Station investigating the use of this data. The Navy is evaluating the data and may request Air Force assistance. The DSP operational system]

(2) FY 1983 Program: The move of the Simplified Processing Station to] has been completed. The purpose of this move was to increase the

] The production option for Mobile Ground Terminals 4-6 has been exercised. The satellite 14-17 spacecraft design is scheduled to be completed with a critical design review in May 1983. Improvements to the spacecraft include satellite-to-satellite crosslink and a mission data message rebroadcast capability. Production of the sensors and spacecraft for satellites 14 and 15 will begin. Integration of DSP satellites to the Titan III (340)/Inertial Upper Stage and Shuttle/Inertial Upper Stage will continue. The first Sensor Evolutionary Development satellite will be delivered. The major improvements on these satellites are improved

] advanced thermal control and an  
[The jam Resistant Secure Communication terminals, which are the primary Mobile Ground Terminal communications capability, will be repackaged to meet the Mobile Ground Terminal requirements for  
] The ground station computer replacement will be completed and the peripheral replacement will begin.

Program Element: F12411P

DOD Mission Area: Strategic Surveillance

Title: Defense Support Program

Budget Activity: Strategic Programs, P3

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The development of the satellite/launch vehicle compatibility will continue. The current plan is to launch the Defense Support Program (DSP) satellites on the following launch vehicle combinations: Satellites 12 and 6R on the Titan III (34D)/Inertial Upper Stage, satellite 5R on the Titan III (34D)/Transstage and satellites 14 and beyond on the Shuttle/Inertial Upper Stage. The design for the ground station compatibility with satellites 14-17 will begin in FY 1984. The ground station changes will be required because of the Defense System Acquisition Review Council (DSARC) direction to upgrade DSP survivability with satellite-to-satellite crosslink [

] a mission data message rebroadcast capability [

]and]

]The crosslink will necessitate front end changes to allow the crosslinked and noncrosslinked data to be separated for processing. In addition, adaptive equalizers will be used [

]The second color focal plane will require software changes and some additional processing capability. The mission data message rebroadcast capability will require a new transmitter,

] will require software for automating wire of the status and commanding and to determine satellite ephemeris. The above RDT&E cost estimates were generated by the program office using contractor inputs and experience on similar modifications in the past. Other planned efforts in FY 1984 are the procurement of satellites 16 and 17 (advance procurement material procured in FY 1982), completion of peripheral replacement funding, start of the large Processing Station satellite 14 compatibility retrofit and modification of operational software to support the new satellites.

(4) (U) Program to Completion: This is a continuing program. RDT&E funding will support satellite/system development in support of Department of Defense requirements. Primary emphasis will be directed toward eliminating or minimizing operational employment deficiencies and vulnerabilities, the use of the Space Shuttle/Inertial Upper Stage in lieu of the Titan IIIC, the development of a survivable DSP system through Mobile Ground Terminals and satellite upgrades, and the adequacy of the ground station data processing capability.

C. MILESTONES:

DATE

D. Delivery of Satellite #5

Mar 1973

F. Delivery of Satellite #6

Jul 1973

G. Delivery of Dual Satellite software

Feb 1974

H. Delivery of Satellite #8

May 1974

I. Delivery of Satellite #7

Oct 1974

J. Delivery of Satellite #9

Mar 1975

ORAN Element: #12431F

DoD Mission Area: Strategic Surveillance

Title: Defense Support Program

Budget Activity: Strategic Programs, #3

H. Delivery of Simplified Processing Station (SPS)	Dec 1978
Q. Retrofit of Titan III(34D)/Inertial Upper Stage (IUS) Compatible Satellite Complete	Jun 1981
S. <u>Move of the Simplified Processing Station to Europe</u>	Nov 1982
T. <u>Retrofit of Satellite SR complete</u>	*(4Q CY 1982) 1Q CY 1983
U. Completion of Computer Replacement	2Q CY 1983
W. <u>Satellite #14 Delivery</u>	*(4Q CY 1985) 1Q CY 1986
A. <u>Satellite Launched</u>	As required

\* Data presented in FY 1983 Descriptive Summary.

EXPLANATION OF MILESTONE CHANGES

- T. Satellite delivery has slipped due to solder joint problem in the sensor.
- V. IOC has slipped due to slip in design effort and to allow time for Initial Operational Test and Evaluation.
- W. Slip due to the more definitive nature of the design and production programs.



Budget Activity: Strategic Programs, #3  
Program Element: #12431F, Defense Support Program

Test and Evaluation Data

1. Development Test and Evaluation: The Defense Support Program has been designed, developed, tested and deployed as an operational system in the early 1970's. The system is a classified space program consisting of ground control and readout stations that receive data from satellites, process the data, and present information to the National Command Authorities and military commanders for decision-making purposes. The program manager is the Air Force Systems Command's Space Division. Space Command is the system operator. Development, Test and Evaluation/Initial Operational Test and Evaluation on the prototype Simplified Processing Station was completed in 1978. Over the next several years three major system upgrades will require Development Test, and Evaluation. They are the Sensor Evolutionary Development and upgrades; the Mobile Ground Terminals; and the Satellite 14 and Beyond survivability upgrades. The Sensor Evolutionary Development satellites will have an increasing number of The major system improvements resulting from this increase is as follows: {

{ During FY 82 the first satellite with an Advanced Atmospheric Burst Locator was launched and tested. These upgrades have three different elements: the satellite, the software modifications and the ground station upgrade which involves replacing the computers. The sensor portion of the satellite is being produced by Aerojet ElectroSystems Corporation, the sensor are produced by the Sandia Corporation, and the spacecraft is being produced and integrated by TRW, Incorporated. Development, Test and Evaluation will be performed at the Aerojet ElectroSystems Corporation and TRW facilities prior to government acceptance, which is scheduled for fiscal year 1983. The satellites will then be stored until there is a launch requirement. The computers are being replaced at all Defense Support Program locations by Aerojet ElectroSystems Corporation. This replacement is scheduled to be completed by fiscal year 1983. Development, Test and Evaluation is being accomplished on this replacement in conjunction with acceptance testing. The ground station peripheral replacement is funded in FY 83-84, and will be tested in the same manner as the computer replacement. The system software is being modified to accommodate the Sensor Evolutionary Development satellites by International Business Machines Corporation. Development, Test and Evaluation will be accomplished prior to turnover to Strategic Air Command scheduled for fiscal year 1984. When the first Sensor Evolutionary Development satellite is launched, Air Force Systems Command will accomplish a system level Development, Test and Evaluation to insure that all elements of the system work together, including the satellite, the ground station hardware and the software. The purpose of the Mobile Ground Terminals is to provide survivability to the Defense Support Program ground processing and communication elements through mobility. They will use the same computer hardware and software as the Simplified Processing Station. The prime contractor is International Business Machines Corporation. Development, Test and Evaluation will be accomplished on the antenna which is new and at the Mobile Ground Terminal system level to ensure that the Mobile Ground Terminal can meet its mobility and communication goals. Primary communications are provided by the Mobile Communications Terminal which will be repackaged to meet the Mobile Ground Terminal requirements. The repackaged Mobile Communications

Budget Activity: Strategic Program, #1  
Program Element: 712431F, Defense Support Program

Terminal will be included in the Development, Test and Evaluation. Satellites 14 and beyond will include several survivability upgrades directed by a Defense System Acquisition Review Council. [

] Development of these satellites started in late fiscal year 1981 and the first will be delivered in late fiscal year 1986. The ground station and software modifications are being defined. The Development, Test and Evaluation program for these upgrades will be similar to the Sensor Evolutionary Development, Test and Evaluation program.

2. (U) Operational Test and Evaluation:

a. Combined Development Test and Evaluation (DT&E) and Initial Operational Test and Evaluation (IOT&E) was performed on the Defense Support Program (DSP) prototype Simplified Processing Station (SPS) from 26 August 1978 to 6 November 1978 at Vandenberg Air Force Base, California. [

] The Space and Missile System Organization (SAMSO) was responsible for DT&E while the Air Force Test and Evaluation Center (AFTEC), assisted by personnel from the Aerospace Defense Command (operating command for DSP), managed and conducted IOT&E.

b. [ The objectives were to evaluate the system's performance and to estimate the reliability, availability and maintainability of an operationally deployed system. The IOT&E report, October 1979, identified three major deficiencies which would prevent the SPS from being operationally useful. These were:

(1) [

(2) [

(3) (U) Excessive computer-generated message error rate - Mission messages were periodically rejected at the data distribution center because of parity error. As a result, mission messages were lost.

c. Additionally, the IOT&E operational availability was [

d. [

]

Budget Activity: Strategic Programs, 13  
Program Element: 712431P, Defense Support Program

e. [

]

f. The systems integration office (SIO) at HQ ABQNH conducted a two-step certification process of the SPS, initially for low-speed teletype and later for high-speed data. The SIO certification was completed in May 1982, resulting in an SPS limited operational capability on 26 May 1982. CINCHORAD was briefed on 30 August regarding SPS status and approved proceeding to full operational capability (FOC) on 2 September 1982. ]

]

g. (U) The total SPS OT&E effort identified 84 deficiencies and 26 program enhancements. AFTEC terminated its monitor role upon declaration of FOC.

h. AFTEC monitored the SAC-conducted phase I IOT&E of the DSP large processing station upgrade (LPSU)[

] Testing was deferred until IOT&E phase II due to the limited equipment configuration at the [ ] Phase II began 15 September at [ ] and is expected to be completed by 31 December 1982. The LPSU is a system which shall provide the DSP with a maintainable ground computer environment at CONUS and overseas ground stations to satisfy current program requirements and to accommodate the new sensor evolutionary development (SED) by an upgrade of the current data reduction central (DRC) system. The upgrade includes the replacement of some DRC hardware components with off-the-shelf equipment and minor software changes for the new equipment. Six separate computer hardware strings will be delivered to operational system and tested. One string is at the,

]

i. (U) OT&E for the sensor evolutionary development satellites 5A/6A, ground communication network upgrade, and the satellite 14-17 upgrades is currently in advance planning.

j. (U) Test planning is in progress for the AFTEC managed IOT&E of the DSP mobile ground system (MGS). Time frame for the MGS IOT&E is early 1983. The MGS is being developed to enhance the survivability of DSP data in pre-, trans-, and post-attack environments through use of mobile, truck mounted data processing, and communications terminals, i.e., mobile ground terminals (MGTs) and mobile communications terminals (MCTs) respectively. The MGT element of the system completed final critical design review (CDR) in July 1982 and fabrication of the terminals is underway. The MCTs will be re-packaged, Army-provided Jam Resistant Secure Communication terminals. Contractor selection for this repackaging effort is underway.

290

392

292

Budget Activity: Strategic Program, #1  
Program Element: #124311, Defense Support Program

k. (U) OT&E Reports published:

- (1) (U) SPS IOT&E Test Plan Final Report, October 1979 (S).
- (2) (U) SPS Phase I FOT&E Final Report, April 1980 (S).
- (3) (U) SPS Phase I FOT&E Final Report, October 1981 (S).

3. System Characteristics:

Characteristics

Objectives

Demonstrated

For the current operational system

Simulation/  
Live Events  
Simulation/Live Events  
Simulation/Live Events  
Simulation/Live Events  
Operational  
Operational  
Simulation/Live Events  
Simulation/  
Limited Live Events

Improvement for Sensor Evolutionary Development and Advanced Atmospheric Burst Locator